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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/079,775	02/19/2002	Marina V. Plat	D900D/1368D	9123

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EXAMINER

LEE, HSIEN MING

APP. NO.

PAPER NUMBER

823

DATE MAILED: 12/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

km

Office Action Summary	Application No. 10/079,775	Applicant(s) PLAT ET AL.	
	Examiner Hsien-Ming Lee	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11/1/03
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 and 13-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 13-17 is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Remarks

1. Claims 1-6 and 13-17 are pending in the application.
2. The Finality is withdrawn.
3. The objection to title and claims 1 and 13 is withdrawn.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chung et al. (US 6,184,142) in view of AAPA.

In re claims 1-3 and 6, Chung et al., in Figs. 6A-6F and related text, teach the claimed method providing a semiconductor device, the semiconductor including a first layer 113/116/112 desired to be etched, the method comprising the steps of:

- (a) providing, by depositing, an antireflective coating (ARC) layer 114 (Fig. 6A), which is a SiON having antireflective properties (col. 4, lines 30-32);
- (b) patterning a resist layer 130, the resist layer 130 including a pattern having a plurality of apertures therein for etching a first portion (i.e. the portion where a dual damascene opening to be formed) of the first layer 113/116/112 (Fig. 6A);
- (c) etching the first portion of the first layer 113/116/112 (Figs. 6C);

- (d) removing the resist layer 130 utilizing a plasma etch with O₂ plasma, the ARC layer 14 being resistant to the plasma etch (O₂ plasma) (Figs. 6A-6B);
- (e) patterning a second resist layer 131, the resist layer 131 including a pattern having a plurality of apertures therein for etching a second portion of the first layer 113/116/112 (Fig. 6D); and
- (f) etching the second portion of the first layer 113/116/112, i.e. forming the opening on the right as shown in Fig. 6F (Figs. 6E-6F).

In contrast, Chung et al. do not teach that the ARC layer has a thickness of less than about 500 Angstroms (claim 1) or 300 Angstroms plus or minus thirty Angstroms (claim 6).

However, the selection of the ARC layer thickness is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious). For example, the thickness is a consideration of optimizing an antireflective properties for etching purpose, as evidenced by AAPA, wherein the ARC layer is typically 300 Angstroms plus or minus thirty Angstroms (pages 1-2).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to select a desired ARC thickness as taught by AAPA in the method of Chung et al., since by this manner it would provide a suitable antireflective property for etching purpose.

In re claim 4, Chung et al. in view of AAPA teach removing the resist layer utilizing a plasma etch with a plasma including a forming gas (i.e. O₂) but do not expressly teach that the plasma includes four percent of the forming gas.

However, the selection of the percentage of the forming gas is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious). In such a situation, applicants must show that the particular range is critical, generally by showing that that claimed range achieves unexpected results. See M.P.E.P. 2144.05 III. In fact, the originally filed specification does **not** demonstrate any criticality and/or novelty as to why the forming gas has to be four percent.

In re claim 5, Chung et al. substantially teach the claimed method, including removing the resist layer utilizing a plasma etch but do not expressly teach providing a wet preclean after the plasma etching step (d).

However, AAPA, in an analogous art, teaches providing the ARC layer 52; patterning a resist layer 53; etching a first layer 51 and the ARC layer 53; and removing the resist layer 53 followed by a wet etch (page 2, lines 9-11).

Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to perform the wet preclean (i.e. wet etch) as taught by AAPA after removing the resist layer in Chung's method, since by doing so it would clean the residues from

the plasma etching (page 2, lines 10-11, AAPA), which, in turn, would benefit the critical dimension of the device.

Allowable Subject Matter

6. Claims 13-17 are allowed.

7. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record, Chung et al. (US 6,184,142), neither teaches nor suggest depositing a *second resist* layer on the SiON layer; *patterning the second resist layer* for etching the first layer in the second region of the semiconductor device; and *removing* the SiON layer.

Response to Arguments

8. Applicant's arguments after Final rejection have been fully considered but they are not persuasive.

Applicants argued that Chung et al. do not teach "etching both the ARC layer and underlying layer prior to removing the photoresist" because Chung et al. teach removing the photoresist (i.e. 130) after transferring the mask image to the hardmask (i.e. 114, SiON) but prior to etching the underlying semiconductor (i.e. 113/116/112). (first paragraph, page 8)

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e. etching **both** the ARC layer and underlying layer **prior to** removing the photoresist) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). In fact, claim 1 uses a transitional phrase "comprising", which

is inclusive or **open-ended** and does not exclude additional, unrecited elements or method steps.

See M.P.E.P. 2111.03

In this case, claim 1 merely recites “(c) etching the first portion of the first layer; (d) removing the resist layer utilizing a plasma etch, the ARC layer being resistant to the plasma etch.” It does **not** recite the **sequential steps** as to which step comes first.

Applicant also argued that “there is no suggestion or motivation to modify the methods taught by the cited reference” to arrive the claimed invention. (first paragraph, page 8)

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Thus, the 103(a) rejection to claims 1-6 is deemed proper.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

NOV. 25, 2003

Hsien-Ming Lee
Examiner
Art Unit 2823

